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THE UNIVERSITY OF HONG KONG

THE GOVERNMENT FRANCHISING OF BUS SERVICES IN HONG KONG: AN EMPIRICAL STUDY INFORMED BY COASE

A DISSERTATION SUBMITTED TO

THE FACULTY OF ARCHITECTURE

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IN CANDIDACY FOR THE DEGREE OF

BACHELOR OF SCIENCE IN SURVEYING

YANG XUE

UNIVERSITY OF HONG KONG

APRIL 2009

DECLARATION

I declared that this dissertation represents my own work, except where due acknowledgement is made, and it has not been previously included in a thesis, dissertation, or report submitted to this University or any other institution for a degree, diploma or other qualifications.

Signature: _____

Name: _____

Date: _____

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LIST OF ABBREVIATIONS

CMB	The China Motor Bus Company
CTB	The CityBus
KMB	The Kowloon Motor Bus (1933) Company
MTR	Mass Transit Railway
NWFB	The New World First Bus

ABSTRACT

This dissertation is an original attempt to use the Coase Theorem formulated in Coase (1959) to evaluate market efficiency in franchised bus transit services in Hong Kong. It identifies three determinants of service efficiency, namely ownership structure, operational scale and finally competition comes from the Mass Transit Railway. The methodologies used were those found in works of leading transport analysts, including those by Filippini and Prioni (2003); Cowie and Asenova (1999); Shaw-Er et al. (2005).

The history of bus franchise in Hong Kong is carefully reviewed so as to provide a proper institutional context for the analysis of market efficiency. The performance of three current franchise bus companies, namely Kowloon Motor Bus Company (1933) Limited (KMB), Citybus Limited (CTB) and New World First Bus Services Limited (NWFB), and one former franchised bus company, namely China Motor Bus Company Limited (CMB), is examined. The key empirical findings of this dissertation are:

(a) the involvement of a property developer in the ownership structure of a bus company may lead to an *increase* in bus fare;

(b) three franchised bus companies, i.e., KMB, NWFB and CMB, in Hong Kong enjoy economies of scale; and

(c) the Mass Transit Railway (MTR), as the biggest competitor of buses, has brought down the average bus fare.

CHAPTER 1

INTRODUCTION

The paper “The Federal Communications Commission” written by Coase in 1959 is on the reading list of my year 3 BSc (Surveying) study for the subject “Land and Construction Economics III”. The lecturer discussed various kinds of market failures with the students, such as the externalities and public goods. The issue on monopolies was covered by the article “The Federal Communications Commission”, in which Coase (1959) discussed the question of property rights of the ether. At that time, any monopolistic operation of a radio station in the United States was restricted by the Federal Communications Commission, despite the Law did not say so. (Coase, 1959) Coase’s discussion on the property rights of the ether and criticism on the Federal Communications Commission lead to similar questions on transportation: who actually owns the public roads and how does the government regulate the public transit services more efficiently?

Background

As Coase (1959) has criticized in his study of the political economy of broadcasting, government intervention is undesirable and

inefficient in the allocation of resource in relating to radio waves in the ether. It was the case that any broadcasting station had to obtain a license from the Federal Communications Commission before it could operate in the United States. This practice was indeed inefficient as the US Government used it as a means of controlling the content of the broadcast messages. The fundamental conceptual question is who actually owns the ether, which can be considered as a common good. (Coase, 1959) A similar question can be asked in the case of a bus franchise: who owns the public roads?

The history of government franchising bus transit services in Hong Kong began in 1933. The original incentive was to enhance the government revenue at that time. (Finances Report, 1933: A (1) 2) Since then, the government has been playing an active role in governing bus transit services. It did not allow China Motor Bus Company (CMB) from obtaining a new franchise in 1998, thus ending a 65-years period of monopoly of bus services mainly on Hong Kong Island. CMB's business was taken over by two other companies with a property development background: both companies are new members of the NWS Holdings Limited, a subsidiary of New World Development Limited. Is the market maintaining high efficiency under this government franchise mechanism? The answer is an empirical question according to the corollary of the

Coase Theorem (Lai and Hung, 2008; Lai et al., 2008). In the real world, where transaction cost is always positive and property rights, i.e., the right of the public roads, are not clearly defined, the way rights and liabilities are assigned will affect resource allocation. (Lai, 2007) For example, the operation costs and incentives to research and development might change in a private enterprise when there is a change in its ownership structure. This dissertation concentrates on the market efficiency in the franchised bus transit services in Hong Kong.

Objectives

The objectives of this dissertation are threefold.

(a) First of all, to test whether the involvement of a property developer in a bus transit company in Hong Kong would lead to an improvement of service efficiency.

(b) Secondly, identify the determinants of the market efficiency, i.e. the economies of scale and competition, of bus transit services in Hong Kong.

(c) Finally, identify the directions for future study on the monopoly power of bus companies in Hong Kong.

Organization

This dissertation has five chapters. Chapter One is the introduction, which includes the background to, objectives and organization of this dissertation.

Chapter Two is a literature review, which includes the revision of theoretical grounds of justifying the concept of government franchise, the study of various methodologies applied by different transport analysts in recent times, and a historical review of the beginning and development of the bus franchises in Hong Kong since 1933.

Chapter Three presents the hypotheses and methodologies. Chapter Four examines the empirical findings from the models set in the previous section and discusses the implications of the results.

Finally, Chapter Five is the conclusion, which discusses limitations of this research and further studies.

CHAPTER 2

LITERATURE AND HONG KONG

HISTORICAL REVIEW

This chapter includes two major parts. The first one is a literature review on the Coase Theorem and methodologies applied to transportation analysis. The second part is a Hong Kong historical review on the origin and development of the franchised bus services.

It is worth mentioning that the Coase Theorem identified by Stigler in 1987 based on Coase's (1960) "The Problem of Social Cost" shares some common ideas with Coase's another work, "The Federal Communications Commission" (Coase, 1959). Some theoretical issues in the latter paper are discussed in this dissertation in order to shed light on the current bus franchise practice in Hong Kong. At the same time, the corollary of the Coase theorem (Lai, 1994; Lai and Hung, 2008; Lai et al., 2008) may also help to better relate the theory together with the practice as the corollary is applied in a real situation.

Theoretical Issues Found in Coase's

"The Federal Communications Commission" (1959)

Coase (1959)'s idea about right of the ether is the theoretical foundation for this dissertation. The fundamental conceptual question raised in Coase (1959) is who owns the ether, which can be considered as a common good. Applying the concept to transportation, the question becomes: who owns the public roads?

The establishment of the Federal Communications Commission was based on an Act passed in the year 1927. Before its establishment, there were some proposals in the United States designed for government control of the operation of the radio industry as a whole in the beginning of last century.

> The initial concern is the safety issue as *mischievous and irresponsible operators* always sent out false signals to ships off shore. Therefore a bill was introduced in 1910, stipulating that *anyone operating a radio station must have a license issued by the Secretary of Commerce.* There was also a recommendation that the Secretary of Commerce should assign the allocation of wave bands by various classes of service instead of using a pricing mechanism. However two

years later, a substitute bill was introduced and became law to limit the *discretionary power of the Secretary*. The main difference between these two bills was that the President was also given with a power to make regulations. A court case in 1921 brought the attention to the discretionary power of the Secretary of Commerce. In the case, a telegraph company, the Intercity Radio Company, could not get its license renewed because that *its use of any available wave length would interfere with the signals of other stations*. The court decision was that *the Secretary of Commerce had no discretion to refuse a license*. The reason of the court decision was that there was no limitations mentioned in the Act on the power of station, hours of operation, and the wave length would be used. In addition, the Secretary had no control over the number of stations that could be established. However, the government passed a joint resolution providing that no license should be granted for more than ninety days for a broadcasting station or for more than two years for any other type of station in afraid of *licensees establishing property rights in frequencies* in 1926. In February 1927, the regulation of the radio industry finally became law, based on which the Federal Radio Commission was established. In

> other words, the Federal Communications Commission was established because of the fear that “private persons and organizations might establish property rights in frequencies without making any payment for appropriating what was called *the last of the public domain*. (Coase, 1959: 2-7, italics author’s)

In Coase’s view, there were at least two pitfalls for the radio industry to be controlled by the Federal Communications Commission. Both lead to inefficient resource allocation.

> The first one comes from the misunderstanding that a resource used in broadcasting is *limited in amount and scarce* especially compared with other resources, for instance newspapers. The government once declared that the ether and the use thereof is the inalienable possession of the people of the United State. This misunderstanding had lead to an inefficient resource allocation in two aspects. For one thing, the Commission was authorized to issue a license if *the public interest, necessity or convenience would be served by so doing*. Once the license was granted, *it could not be transferred to anyone else without the approval of the Commission*. This kind of practice is obvious a contradictory

to the concept of laissez-faire, which advocates the minimum government interventions. For the other thing, although the Federal Communication Commission was not bound by the antitrust laws, it still might *refuse an application for a license because of the monopolistic practices of the applicant*. This kind of refusal killed the possibility of operating at a more efficient level by a monopoly in the broadcasting industry. This possibility had been raised by Mr. Daniels, who judged that *there are only two methods of operating the wireless: either by the government or for it to license one corporation. Radio, by virtue of the interferences, is a natural monopoly*. Coase also used an analogy to illustrate a similar point: *regulation of radio was therefore as vital to its development as traffic control was to the development of the automobile*. There is a fixed natural limitation upon the number of stations that can operate without interfering with one another. (Coase, 1959: 6-7, 20, italics author's)

The second misunderstanding is that since broadcasters are making use of public property, *the government has a right to see that such public resources are used "in the public interest"*. The argument made by the government resulted in its intervention on the program content of the radio station

> and thus an efficiency loss to the society. *When the time comes for renewal of the license, which at the present time is every three years, the past programming of the station is reviewed*. However, there should be *no reason why there should not be private property in frequencies* and thus no limitations on the program content. If the criterion of "public interest" were limited to such matters, *how could the Commission choose between two applicants for the same facilities, each of whom is financially and technically qualified to operate a station?* Coase himself answered that the question of who, out of the many claimants, should be allowed to use the scarce resource is usually done in the American economic system is *to employ the price mechanism without the need for government regulation*. The answer in fact indicated back to the first misunderstanding on the property right, as he further pointed out that *the real cause of the trouble was that no property rights were created in these scarce frequencies*. (Coase, 1959: 13-14, italics author's)

The reasons about pitfalls of the controls over the radio industry in the United States actually justified the bus franchise in Hong Kong. As

Coase said, “a private-enterprise system cannot function properly unless property rights are created in resources, and, when this is done, someone wishing to use a resource has to pay the owner to obtain it.” (Coase, 1959: 14)

First of all, Coase’s argument of the institutional arrangements of property rights of the frequency can be considered as a justification for the idea of a franchise, provided that it is obtained by contract (Lai, 1994). A bus franchise from the government can be considered as an initial property right determined by contract and their subsequent rearrangements are also left to the market.

> It is not clear that the solution in which there is *no interference is necessarily preferable*. When large numbers of people are involved, the *argument for the institution of property rights* is weakened and that for *general regulations* becomes stronger. In these circumstances it may be preferable to impose special regulations. It should not be thought that, because some right are determined by regulation, there cannot be others which can be modified by contract. Once the rights of potential users have been determined initially, the *rearrangement of rights could be left to the market*. It is *not necessary* to abolish the institution

> of private property *in order to control the growth of monopolies*. It can be solved by delimiting the rights which various persons possess. How far this delimitation of rights should come about as a result of a strict regulation and *how far as a result of transactions on the market is a question that can be answered only on the basis of practical experience*. But there is good reason to believe that the present system, which *relies exclusively on regulatio*n and in which private property and the pricing system play no part, is not the best solution. (Coase, 1959: pp. 14-15, italics author's)

Furthermore, there is often (but not always) a trade off between market efficiency and social equity. A monopolistic market does not necessarily involve government interventions in the sense that the government actually runs the monopoly (Lai and Yu, 2003). For one thing, the monopoly would not get the chance to fully exploit its consumers' surplus because of the potential competitor who might enter to the market. For the other thing, the monopoly would encounter a loss if it adopts "marginal pricing" by price discrimination as it typically produces at decreasing cost (Lai and Yu, 2003: 226-228; Lai, Davies and Lorne, 2008a: 410-411; 2008b: 556-557). However, if it can realize

internal cross-subsidy, market efficiency can be improved at a lower transaction cost. Coase (1959: 19) mentioned the “distribution of funds”, which employs a similar mechanism as the cross-subsidy.

> The operation of a market is not itself costless. Insofar as the ability to pay for frequencies or channels depends on the *distribution of funds*, it is the distribution not between persons but between firms which is relevant. And here the *ethical* problem does not arise. All that matters is whether the distribution of funds contributes to *efficiency*, and there is every reason to suppose that, broadly speaking, it does. (Coase, 1959: 18-19, italics author’s)

Finally, Coase’s criticism of the Federal Communications Commission indeed reveals the possibility of efficiency gain from a government franchise:

> What needs to be emphasized is that the problem, so far as the Federal Communications Commission is concerned, largely arises because of a failure to charge for the rights granted. This provision of a valuable resource without charge naturally raises the income of station operators above *what it would have been in competitive conditions*. The frequency is public property, and the *grant of a license* gives no rights of

> any sort in that frequency. However, the Commission almost always approves such *negotiated transfers*, and, when these take place, there can be little doubt that often a great part of the *purchase price is in fact payment for obtaining the use of the frequency*. There is no analytical difference between the right to use a resource without direct harm to others and the right to conduct operations in such a way as to produce direct harms to others. (Coase, 1959: 22, 26, italics author's)

According to the corollary of the Coase Theorem (Lai, 1994; Lai and Hung, 2008; Lai et al., 2008), the way rights and liabilities are assigned, i.e., which company obtains the bus franchise from the government, does influence the resource allocation of the market, i.e., the market efficiency. After obtaining initial franchises from the government, private companies own the right to use the public roads and the right to provide bus transit services to the public. According to Coase's (1959) idea, if these private companies can freely reallocate these rights after it obtained from the government, the market efficiency can be ensured. Nevertheless, the government has been playing an active role in governing bus transit services since the first franchise was granted. This can be considered as an intervention that can reduce market efficiency. Whether this is so is an empirical question.

Methodologies in Transport Analysis

There is a huge literature on the ownership structures of bus services and their impact on services efficiency, in the UK, the US, Europe and Asia.

Different transportation analysts have different opinions on the question of economies of scale. An important work is that by Filippini and Prioni (2003) about bus service provision in Switzerland. In their research, the focus is on the ownership structures of bus transit companies and their economies of scales. They concluded that medium-sized bus companies out of all 34 bus operators under study managed to operate at a slight return to scale (Filippini and Prioni, 2003: 689-690). Some studies elsewhere indicated similar results (Farsi et al., 2007; Farsi et al., 2006; Shaw-Er et al., 2005; Fraquelli et al., 2004; Cambini and Filippini, 2003; Bhattacharyya et al., 1995; Viton, 1993; Shleifer, 1985), whereas others indicated the opposite (Cowie, 2002; Cowie and Asenova, 1999; Chapin and Schmidt, 1999; Simpson, 1996; White, 1995; Berechman and Giuliano, 1985).

In the literature on the ownership structure of bus services and its impact to services efficiency, one major UK topic is the British Transport

Act of 1985. The Transport Act 1985 introduced three main changes to the UK bus services: deregulation, involving the removal of barriers to providing local bus services; the transfer to the private sector of publicly-owned bus companies; and competitive tendering whereby local authorities were given powers to fund socially necessary but unprofitable services by tendering routes to bus companies. (Simpson, 1996)

It was found that the costs per bus-kilometer had fallen significantly primarily because of increased labor productivity after the deregulation of local bus services under the Transport Act 1985 (White, 1995). White (1995) further argued that much competition took the form of expanding bus-kilometers run, rather than in price reduction. Therefore, while the public expenditure had fallen substantially, the bus companies had remained profitable. White thus concluded that increase interest in the role public transport could benefit buses substantially (White, 1995: 185). These UK findings can be considered as support for bus franchise in an initial phase.

More recently, Cowie (2002: 147) noted that since privatization, five major British bus operators had emerged to dominate the market. He estimated the technical efficiency using data envelopment analysis. Under assumptions of constant and variable returns to scale, Cowie

concluded that over the period, efficiency had improved. However, this result could not be wholly attributed to the achievement of economies of scale (Cowie, 2002: 156).

On the subject economies of scale, transport analysts had different opinions, Cowie and Asenova (1999: 231.) argued that "increasing returns to scale are found for smaller companies, but the size of such returns varies with the company type." They also identified a minimum efficiency scale with constant returns beyond that point (Cowie and Asenova, 1999: 231). In the field of rail freight, Chapin and Schmidt (1999: 147) held a similar opinion that "mergers increase technical efficiency in the first stage, but reduce scale efficiency; many merged firms are larger than efficient scale." Berechman and Giuliano (1985: 313) pointed out that the exact interpretation of theoretical concepts of scale economies and bus transit would influence the interpretation of empirical findings, given the fact that constant, decreasing and increasing returns to scale have all been reported.

Interestingly, unlike the case of the UK, most analysis of bus services in other countries or regions seem to support increasing returns to scale. Some of them are discussed below. M. Filippini, et al. conducted several studies on the cost and ownership structures of the Swiss urban

public transport sector (Farsi, Fetz and Filippini, 2007; Farsi, Filippini and Kuenzle, 2006; Filippini and Prioni, 2003). “In Switzerland, providers of bus transportation are traditionally corporations, though a large part of their equity shares are still held by the public sector (federal government, cantons, municipalities)” (Filippini and Prioni, 2003: 683).

Based on the theory regarding property rights that productivity and performance are higher in the private than in the public sector, Filippini and Prioni (2003: 689) partially confirmed that if the private sector holds shares in the company, efficiency is enhanced. Three years later, more advanced models were used to distinguish inefficiency from the unobserved firm-specific heterogeneity in a network industry, for instance local bus services (Farsi, Filippini and Kuenzle, 2006). The results finally suggested “*increasing returns to scale*” and “*economies of scope*” in the Swiss urban public transport sector (Farsi, Fetz and Filippini, 2007).

Results similar to the Swiss case were found in the Italian regional bus industry. In one of the studies conducted in Italy, a translogarithmic variable cost function was estimated to assess the behaviour of returns to scale and the impact of network characteristics (Fraquelli, Piacenza and Abrate, 2004). This analysis was based on a

sample of 45 Italian municipal companies observed from 1996 to 1998 and including both specialized and mixed transit operators. The results confirmed the existence of natural monopoly in the industry and support a regulation introducing competitive tenders to access to the market (Fraquelli, Piacenza and Abrate, 2004). Cambini and Filippini (2003) also pointed out that one of the main problems Italian local authorities had to face is setting the area size to be assigned a franchised monopoly. "The empirical results showed that the bus transportation sector is characterized by the presence of economies of density and scale; and implied that the best strategy for introducing competition in the bus industry is a competitive tendering approach for an area of given dimension and not necessarily a route-by-route tendering." (Cambini and Filippini, 2003: 163)

Similar arguments and proposals were also raised in the U.S. context. For example, Shleifer argued that "in the typical regulatory scheme a franchised monopoly has little incentive to reduce costs." (Shleifer, 1985: 319) However, if a mechanism could be established so that the price the regulated firm receives depends on the costs of identical firms, each firm chooses a socially efficient level of cost reduction in equilibrium (Shleifer, 1985: 319). In other words, a competitive tendering approach can be an appropriate mechanism. Viton (1993) also proposed

to consolidate larger systems for public urban transit services in the San Francisco Bay area, so that economies of scale can be realized.

Finally, Asian transport studies had similar conclusions. For example, Indian scholars estimated the determinants of cost inefficiency of several publicly operated passenger-bus transportation companies in terms of their ownership structure as well as other firm-specific characteristics: inefficiency shall be specified in such a way that both its mean and variance are firm- and time-specific. (Bhattacharyya, Kumbhakar and Bhattacharyya, 1995: 47)

One of the Asian researches conducted in a neighboring region, Kaohsiung, Taiwan Province, concluded that the Kaohsiung City Bus (KCB) could obtain cost-saving benefits by extending its output scale because of the existence of "*returns to density*" (Shaw-Er, Wang and Chen, 2005: 1399). It employed the concept of "*economies of density*" and thus noted the effects of technological progress could lead to cost saving for the KCB (Shaw-Er, Wang and Chen, 2005). This empirical finding shed light on private organizations' incentive for investment in research and development. However, this is not a suitable model for Hong Kong since the public transportation in Kaohsiung is not widely used by the public in terms of the users to population ratio. Therefore, the

model of Filippini and Prioni's (2003) about bus service provision in Switzerland is adopted because of similar popularity in the public transportation.

Hong Kong Historical Review

This historical review aims at obtaining a more comprehensive understanding of the bus franchise in Hong Kong so as to provide a clearer context for the research. First of all, the beginning and intention of the government bus franchise is examined from the government's perspective. Then, the development of three existing franchised bus companies and one former franchised bus company is described to provide background information for hypotheses testing. Finally, the impacts of the operation of the Mass Transit Railway, which started in 1979 (Hong Kong Annual Report, 1980: 149), are discussed. All figures and relevant references are made to Hong Kong Annual Report and the Hong Kong Bus written by Chan (1999).

The Genesis of A Bus Franchise

Coase mentioned that "a government department, in making up its mind whether or not to undertake a particular activity, should weigh against the benefits this would confer, the costs which are also involved:

that is, the value of the production elsewhere which would otherwise be enjoyed." (Coase, 1959: 21) The Hong Kong Government in 1933, when the first bus franchises were granted, was thinking exactly this way.

As implied from the Appendix A of the "Report on the Finances for the Year 1933" of Hong Kong, the initiative of bus franchise aimed at increasing the government revenue. The China Motor Bus Company (CMB) and the Kowloon Motor Bus Company (KMB) were first granted the right to operate bus services respectively on the Island of Hong Kong and the Kowloon Peninsula (including the New Territories) on 11 June that year. The two companies, categorized as public utilities companies had to pay royalties to the government based on gross annual receipts. At the same time, the Hong Kong and Yaumati Ferry Company was also granted a similar right to operate a passenger and vehicles ferry service in the Harbour. The royalties payable by KMB and CMB in the year of 1933 were $63,592 and $48,287 respectively. These two amounts were categorized as "*miscellaneous receipts*" in that year's Financial report.

> Three new subheads under the last classification appear for the first time in 1933 as a result of franchises granted to Motor Bus and Ferry Companies as follows: -
>
> The China Motor Bus Company and the Kowloon Motor Bus Company for the privilege of maintaining services of

> motor buses on the Island of Hong Kong and the Kowloon Peninsula including the New Territories respectively for a period of 15 years from the 11th June 1933 pay certain royalties or percentages based upon gross annual receipts.
>
> The Hong Kong and Yaumati Ferry Company for the privilege of maintaining a passenger and vehicles ferry service for a period of 15 years from the 12th June 1933 pay certain royalties or percentages based upon gross annual receipts. (Financial Report, 1933: A (1) 2)

Later in that year, the Legislative Council addressed the issue regarding operational defects from the franchised bus companies. It was recorded in the Hong Kong Legislative Council Minutes, dated 12 October 1933, that 'constant breakdowns of buses took place, especially when going up Garden Road'. (4: 115) In addition, certain grievances regarding the bus services on the Kowloon side were also reported in the *South China Moring Post* at that time. It thus raised the issue on drivers' low wage rate, which resulted in the lack of professional experience and thus was probably the cause to the poor bus services.

> At first, no doubt, there was every disposition on the part of the bus-using public to adopt rather a lenient view of the shortcomings of the new services on both sides of the

Harbour, having regard to the fact that new Companies were taking over these services and that it was only fair to give them sufficient time to get into their stride.

Such lenient considerations are, however, now no longer applicable seeing that these new bus services have already been running for four months.

At the commencement of the new services, constant breakdowns of buses took place, especially when going up Garden Road, and, even recently, breakdowns on Garden Road, still occur, whereas such breakdowns under the regime of the Hong Kong Hotel Company were practically unknown.

If such breakdowns are in any way attributable to the obtaining of less experienced drivers at lower wages, then such saving has been distinctly false economy, both from the point of view of the Company and also of the travelling public who have a right to expect a punctual and efficient service.

Another complaint which has been voiced in the columns of the local Press, and which is doubtless also due, in a measure, to drivers having insufficient experience, is the failure of the buses, especially on the Hong Kong side of

> the Harbour, to keep to a proper regular schedule of times, thereby causing grave inconvenience to passengers going to and from their offices.
>
> In Kowloon special grievances have recently been ventilated in the South China Moring Post, namely the insufficiency of buses on certain routes at certain hours.
>
> We trust that the Government will fully investigate the above matters with a view to their being remedied as it is so obviously necessary that the regularity and efficiency of public utility companies should, in the interests of the public, be fully maintained. (Hong Kong Legislative Council Minutes 12th October 1933: 115)

In the Hong Kong Government's Reports on the Finances of the following years, the royalties payable by the two franchised bus companies were recorded in details. In most of the initial few years, the royalties payable were *reported to outperform the estimation made in the previous year*. Particularly, in the year of 1937 and 1938 the royalties payable increased substantially. It was reported that the increased royalties payable on gross receipts by omnibus and ferry companies contributed to the satisfactory fiscal result in 1937, whereas the increase reflected the increase in population. In 1938 the recorded substantial

increases were also attributed to the correspondingly increasing magnitude of the population.

> The estimated revenue from Head 9, Miscellaneous Receipts, was more than doubled as a result of the abnormal conditions resulting in large royalty payments by the transportation companies. (1938 Financial Report: A 5)
>
> 1934 Financial Report:
>
> Royalty payable by Kowloon Motor Bus Co., Ltd. was estimated to be $140,000, but was actually $128,094, decreased by $11,906.
>
> 1935 Financial Report – Appendix A:
>
> Royalty payable by China Motor Bus Co. was estimated to be $110,000, but was actually $118,275, increased by $8,275.
>
> Royalty payable by Hong Kong & Yaumati Ferry Co. was estimated to be $90,000, but was actually $99,782, increased by $9,782.
>
> Royalty payable by Kowloon Motor Bus Co., Ltd. was estimated to be $132,000, but was actually $117,505, decreased by $14,495.

1936 Financial Report – Appendix A:

Royalty payable by China Motor Bus Co. was estimated to be $112,000, but was actually $124,088, increased by $12,088.

1937 Financial Report:

Royalty payable by China Motor Bus Co. was estimated to be $96,000, but was actually $128,708, increased by $32,708.

Royalty payable by Kowloon Motor Bus Co., Ltd. was estimated to be $114,500, but was actually $140,991, increased by $26,491.

1938 Financial Report:

Royalty payable by China Motor Bus Co. was estimated to be $110,000, but was actually $194,702.65, increased by $84,702.65.

Royalty payable by Hong Kong & Yaumati Ferry Co. was estimated to be $124,000, but was actually $222,495.65, increased by $98,495.65.

Royalty payable by Kowloon Motor Bus Co., Ltd. was estimated to be $126,000, but was actually $225,672.29, increased by $99,672.29.

1939 Financial Report:

Royalty payable by China Motor Bus Co. was estimated to be $175,000, but was actually $257,874.17, increased by $82,874.17.

Royalty payable by Hong Kong & Yaumati Ferry Co. was estimated to be $175,000, but was actually $429,119.75, increased by $254,119.75.

Royalty payable by Kowloon Motor Bus Co., Ltd. was estimated to be $180,000, but was actually $382,281.56, increased by $148,281.56.

In the 1939 Taxation Committee Report, published 6 years after the franchise was granted, 'Miscellaneous revenue, including royalties from public utilities' was regarded as 'one of the main classes of revenue to be met with in the modern world'. The objective of the report was to summarize pros and cons of the existing taxation, and further discussed the possibility of extending the taxation base and taxation rate in Hong Kong to increase government revenue. It further discussed "the possibility of securing revenue from the introduction of other monopolies. Transport Companies (Buses, trams and ferries) at that time were still categorized as utility companies. It was reported that the royalties collected from Public Utilities (Including Ferry Licenses) reached at

$1,033,401, which took approximately 3% of the total government revenue that year. It was decided that the rate for the franchised bus companies should be remained unchanged.

> We have considered whether increased revenue could be derived from public utilities – transport, electricity, gas, telephones, etc. – having due regard to the possibility of the public being involved in increased charges.
>
> We consider that the present arrangement should be left undisturbed. We observe, however, that the Tramways' royalty will increase to 25% of the company's working profits in the near future and that the royalties payable by the Ferry Companies are already increasing. (1939 Taxation Committee Report: 95)

The operation of bus franchise became finally governed by law in 1975 as a new Bill, *Public Omnibus Services Ordinance*[1], was introduced into the Legislative Council. Public omnibus services are operated under franchises granted in accordance with the provisions of the Public Omnibus Services Ordinance, which came into operation on September 1, 1975. Three private companied provide facilities on specified routes with

[1]See the *Public Bus Services Ordinance* Cap 230, Laws of Hong Kong

schedules of service laid down by the Transport Department covering routes, timetables, faretables, journey distance, journey time, vehicle allocation, and vehicle carrying capacities. Furthermore, the franchise started to be granted in a new fashion in 1975: the franchise was granted route by route instead of by different regions.

> With the introduction of the new public Omnibus Services Ordinance, both CMB and KMB began operating under new franchises on September 1. The franchises give the companies exclusive rights to operate bus services on specified routes as opposed to the previous franchises which were granted on a geographical basis. A feature of the new franchises is the fixing for the first time of a permitted rate of return for the companies. In the case of KMB, the return rate is 16 per cent based on the valuation of its fixed assets in July 1959 – when the company's assets were last valued. For CMB, the return rate is 15 per cent based on a valuation carried out in 1962 when the company first issued its shares to the public. Another feature is the establishment of a profit control scheme under which each company is required to maintain a Development Fund, with any profits earned in excess

of the permitted rate of return being credited to the fund. In a year when either company earns less than the permitted rate of return, it will be allowed to draw from the fund the amount needed to bring it up to the permitted return rate. The main purpose of the fund is to assist with capital expansion of bus operations by ensuring retention of profits in the company for this purpose, and also to serve as a profit equalization fund. The new franchises will last for 10 years in the first instance, up to August 31, 1985. But the concept of a rolling franchise has been accepted, with the possibility of extensions every two years following comprehensive reviews of the companies' operations and their performance under the franchises. An additional provision of the Public Omnibus Services Ordinance is that the Governor may appoint up to two directors to each company's Board of Directors, and these directors would be empowered to represent the public interest rather than that of the shareholders. (Hong Kong Annual Report, 1976: 136-137)

The Development of the Franchised Bus Companies

The Kowloon Motor Bus (1933) Company

The Kowloon Motor Bus (1933) Company (KMB), established on 13 April 1933, started its franchised bus operation on 11 June 1933. It has the longest history of running franchise bus transit service in Hong Kong: 76 years by 2009.

Bus services in Kowloon and the New Territories were operated by KMB in accordance with the franchise granted by the government in 1933. KMB got its franchise renewed first in year 1948 for a further 10 years. Later in 1960, its franchise was extended till 1975. Its bus fares began to adopt a charge based on different sections of the routes in the same year. In 1968, negotiations started between the KMB and the Hong Kong Government on the need to revise the financial terms of the franchise as a consequence of KMB's intention of increasing its carrying capacity. In year 1975, KMB's franchise was extended for another 10 years, however, subject to review every two years. The latest recorded extension on the bus franchise for KMB was in year 1997, in which the franchise was going to expire on 31 July 2007. Currently, KMB still operates as a franchised bus company mainly in Kowloon and the New

Territories. The franchise has a further period not exceeding 5 years, till 31 July 2012. (s. 6 (2), Public Bus Services Ordinance[2])

KMB once faced extreme difficulties of buses shortage as a number of its buses were commandeered by the Japanese during the Occupation (December 1941- August 1945) according to the Hong Kong Annual Report of 1946 and 1947. As a result, most of the buses were so damaged that they were not usable for picking up passengers after liberation in August 1945. Although "*skeleton services*" were resumed immediately, KMB had to make use of trucks as "*makeshift buses*" in other non-major routes. Although KMB ordered new buses from Britain, the deliveries during the first few years were always delayed. This bus shortage led the company into severe situations. Consequently, passengers were asked for higher fares, which was as twice as the pre-war time. This situation continued from the year 1946 through the year 1947, KMB succeeded in getting 30 new buses delivered. Although encountering higher operation costs, KMB was able to reduce fares on suburban routes. Because of the swollen population and the delay from bus order deliveries, KMB had not succeeded in withdrawing all makeshift buses until the year 1952.

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[2] See the *Public Bus Services Ordinance* Cap 230, Laws of Hong Kong

The construction of the first depot for KMB buses commenced in 1955 at To Kwa Wan. This was completed in 1958. Another depot at Lai Chi Kok commenced in July the same year and was ready for occupation by the middle of 1958. Later, as services expended, land at Kwun Tung with a total area of approximately 200,000 square feet was purchased by KMB in 1961 to construct two multi-storey depots. By the end of year 1965, two three-storey bus depots had been commissioned while a third was nearing completion. These depots, which accommodated over 1,000 buses, were believed to be the first multi-storey double-decker bus depots in the world. (Hong Kong Annual Report, 1946: 90; 1947: 114-115; 1952: 138; 1955: 153-154; 1958: 222; 1961: 235; 1965: 187-188)

Notably, KMB became a listed company in year 1961. In 1980 Sun Hung Kai Properties, which became one of the largest local developer, purchased 30% of KMB's shares. The impact of the property developer's involvement shall be examined in later sections. Without doubt, KMB can be regarded as a pioneer in new technology utilization among the franchise bus companies in Hong Kong. It introduced 64 different bus models from 1933 to 1998, and the size of the bus fleet far exceeding other companies.

The China Motor Bus Company

The China Motor Bus Company (CMB) started its franchise operation together with KMB on 11 June 1933. However, it lost its franchise on 31 August 1998. At the beginning of its franchise, CMB's operation concentrated on the Hong Kong Island. It faced similar difficulties of bus shortage as KMB after the defeat of Japan. Although CMB also ordered new buses from Britain, the deliveries during the first few years were always delayed. This situation continued from the year 1946 through the year 1947. CMB was not as fortunate as KMB: it had to wait until the year 1948 to get new buses delivered from Britain. In addition to the bus supplies shortage, CMB also encountered difficulties in finding men with suitable qualifications for training as bus drivers during that period. The significantly increased demand had partially alleviated the operation difficulty. (Hong Kong Annual Report, 1946: 90; 1947: 114-115)

According to the Hong Kong Annual Report (1957: 252-253) CMB firstly commenced its depot construction in January 1957 at North Point, at which the Company also set up its staff quarters and welfare centre. For garaging of vehicles at night, the stores department, machine shops, and component overhaul sections had all been located on the upper storeys of the building. CMB acquired at public auction a further site of

20,000 square feet for garaging its expanding fleet in the latter part of 1958. By the year of 1961, CMB also provides low cost housing for some 250 employees and their families and planned additional housing units at its new King's Road Depot. (Hong Kong Annual Report, 1961: 235) In 1962, CMB became a listed company, one year later than KMB. (Chan, 1999) At the end of 1975, CMB then completed a multi-storey depot at Chai Wan capable for accommodating 450 large capacity double-deck buses. (Hong Kong Annual Report, 1976: 136-137)

The government had carried out a review with public participation to examine the cost effectiveness of the companies' operations including bus depot. It was initiated in April 1981, and was completed in June 1982. During the 65 years of its franchised bus transit service, CMB introduced totally 44 bus models, at an average rate of one every 1.5 years one new model introduced, compared with the one every 0.88 year of KMB.

In year 1986, the length of extension of bus franchises for KMB and CMB diverted for the first time. When the new extension period was 10 years for KMB, it was only three years for CMB. Chan (1999) mentioned that the deteriorating service of CMB as a major concern to the Government.

Since 1986, the franchise period granted by the government to CMB had been two to three years in length. Finally, in year 1993, CMB's franchise was extended for another two years but some of its franchises on certain routes were ceased. Some of the franchised routes of CMB were taken over by the CityBus in the following 5 years until CMB lost all franchise routes in the year 1998. According to the *Public Bus Services Ordinance*[3], CMB at least would notice the cessation of its franchise not less than 9 months before the expiry of the period.

The CityBus

The CityBus Limited (CTB) had been running non-franchised bus services since 1979. It became the fourth Hong Kong franchised bus operator in 1991 when first obtained a franchise for a bus route between Central (Macau Ferry) and MacDonnell Road (12A) in 1991. It should be noticed that this was the first franchised bus route awarded by competitive tender. In 1993, CTB took over 26 routes, including 2 cross-harbour routes, from CMB. Later in 1995, CTB took over another 14 routes from the CMB, and became one of the two major bus operators on the Island. The latest record shows that CTB operates two bus networks under two franchises.

[3] See the *Public Bus Services Ordinance* Cap 230, Laws of Hong Kong

CTB's first franchise on Hong Kong Island covers the period from 1 September, 1996, to 30 June, 2006. It also had a second franchise – lasting from 1 June 1997 until 31 May 2003 – to operate a network of 15 routes linking major district in Hong Kong and Kowloon with Tung Chung and the new airport at Chek Lap Kok. The current franchises run from 1 July 2006 to 30 June 2011 and 1 June 2008 to 31 May 2013 respectively as a further franchise period can not exceed 5 years. (s. 6 (2), Public Bus Services Ordinance[4])

The New World First Bus

A new franchise was awarded to the New World First Bus Services Limited (NWFB) to operate on Hong Kong Island from September 1, 1998. It started from taking over the 88 routes from CMB, which ended all its franchised bus services on the same date. It should be noticed that both CTB and NWFB are members of the Chow Tai Fook Enterprises and NWS Holdings, the latter also a subsidiary of one of the biggest local property developers, New World Development.

[4] See the *Public Bus Services Ordinance* Cap 230, Laws of Hong Kong

Impacts of the MTR

The operation of the MTR and the introduction of higher bus fares granted in February 1980 had a significant effect on bus services. This was particularly noticeable on the cross-harbour and coach services routes, and on routes running parallel to the railway, where demand dropped.

Since 1982, KMB concentrated its services expansion on the developing new towns in the New Territories partially to avoid competition with the MTR. The increase in that year in the rail capacity significantly improved services to the public, and bus passenger demand along the MTR corridors generally fell by 16 per cent. Nevertheless, the easing of pressure on these services has brought benefits in terms of less overcrowding and reduced waiting times. CMB also tried to make reorganizations on its services to confront the challenges due to operation of the MTR Island Line, including MTR feeder services.

With the opening of the first cross-harbour tunnel (Hung Hom to Causeway Bay) to traffic on August 3, 1972, the two major bus companies, CMB and KMB, introduced three jointly operated services linking the urban areas of Kowloon and Hong Kong Island. In the following years, these increased to 5, 6, 12 and finally 18 routes in 1979.

These routes were very popular among the passengers until the operation of the first phase of the MTR in 1981. The opening of the MTR and the introduction of higher bus fares in February 1981 had a significant effect on bus services. This was particularly noticeable on the cross-harbour and coach services routes, and on routes running parallel to the railway, where demand dropped. The cross harbour bus service network finally had a moderate expansion during the year of 1988 when the cross harbour section of MTR had reached its capacity in the peak period. Nowadays, 73 routes are operated by individual companies or jointly provided.

Judging from Figure 1, we can actually find out that in the first three years of the operation of the MTR, both KMB and CMB had no increase in their fleet size. Furthermore, the number of MTR riders kept increasing, exerting sheer pressure on the franchised bus transit services. A detailed quantitative study of the MTR impacts using publicly available data is made in later sections of this dissertation.

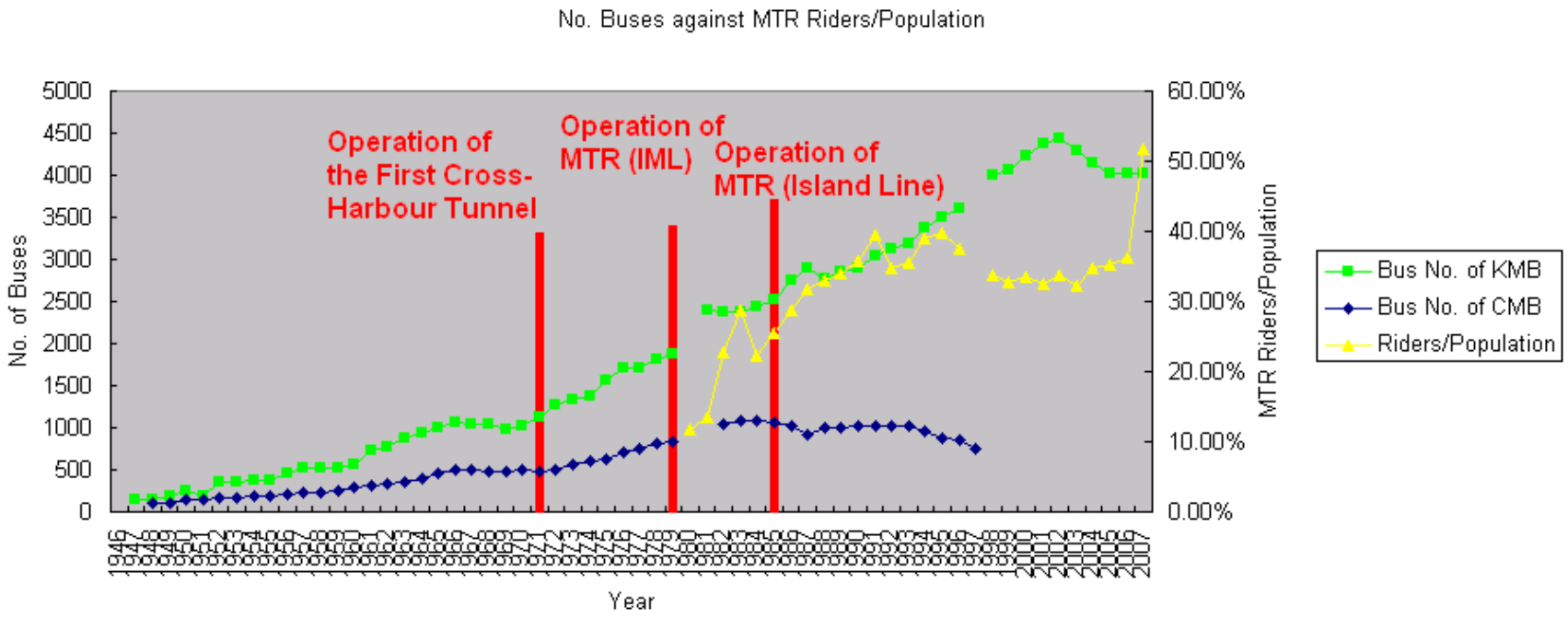

Figure 1 Bus Fleet (No. of Registered Buses) against MTR Riders to Population Ratio

CHAPTER 3

HYPOTHESES AND METHODOLOGY

This chapter introduces three hypotheses designed to achieve the objectives of this dissertation. Then, it discusses the methodology adopted for evaluation of the hypotheses, which is based on the cost function specified in the work of Filippini and Prioni (2003). Finally, and more importantly, it describes the data collected and their limitations.

Hypotheses

As discussed in the literature review, a private ownership structure may contribute to the service efficiency comparing with a public ownership structure. Furthermore, a monopoly can be justified on grounds of economies of scale. Nevertheless, the extent of monopoly power is more critical as competition may also increase market efficiency.

There can be thus three empirical hypotheses regarding the market efficiency of bus transit services in Hong Kong in light of their historical development:

(1) The involvement of property developers in the bus transit companies has a positive impact on service efficiency, measured in terms of cost per kilometre, (H1);

(2) the market of bus transit services in Hong Kong is subject to increasing return to scale, (H2); and

(3) the operation of MTR, the major competitor with bus transit, has a positive impact on service efficiency, (H3).

Methodology

As mentioned above in the literature review, a good reference is the work of Filippini and Prioni (2003) on bus service provision in Switzerland. In particular, it provides a mathematic way of specifying the cost function for bus transit industry.

The total cost of a bus transit company C is assumed to be a function of the output y, the network characteristic n, the factor prices p (labour L, capital C and energy E) and the variable P representing the ownership variable. Finally, the variable T captures the effect of technical change occurring over time." (Filippini and Prioni, 2003: 685)

Given the above definition and the specific situation in Hong Kong, the following cost function is specified for evaluation:

$$C = c(\text{Mileage, Passenger, P, M, L, Deflator})$$

where C is the total cost of a bus transit company and is assumed to be a function of the variable Mileage, which refers to the mileage the buses cover in one year;

variable Passenger, which stands for the passengers the buses carry in one year;

variable P, which represents the ownership variable;

variable M, which captures the presence of MTR operation; and

variable L, which indicates the major service location of different companies.

Finally, the Deflator (the GDP Deflator) captures the changes in price levels over time as the data panel has a relative long span of 46 years (i.e., 1961 to 2007).

It is worth mentioning that the GDP Deflator is used instead of the CPI (Consumer Price Index), which is also a common indicator for price level change. The GDP deflator is chosen to reflect on the changes in price levels. As a matter of fact, there is no significant difference in

terms of results derived under these alternative price indicators. Nevertheless, the GDP Deflator is considered a more proper indicator because of the nature of bus fares. As mentioned in the above historical review, the profit margins for each individual bus company are closely related to government decisions. The government collects loyalties from the franchise bus companies based on their profits and approves/rejects any proposed changes in bus fares. Therefore, a GDP deflator showed better capture the change in price levels in the nominal bus fare changes.

Both variables “Mileage” and “Passenger” are continuous variables that represent the output of the bus company. P, M and L are all dummy variables. P equals 1 if parts or all of the shares of a bus transit company are held by a property developer; 0 if otherwise. M equals 1 if it is a year in which MTR operates; 0 if not. L equals 1 if a company operates mainly on Hong Kong Island; 0 if it operates in Kowloon and the New Territories. The DGP deflator is also a continuous variable and is in an index form, taking the year 2006 price level as 100.

Given the focus of H1 is on ownership structure, the data collected from the three existing and one former franchised bus transit companies in Hong Kong are pooled together in the regression model. This aims at identifying the coefficient for the dummy variable P. Recall

that the previous review on franchised bus services in Hong Kong, Sun Hung Kai Properties first purchased 30% shares of the Kowloon Motor Bus (1933) Corporate in 1980; whereas the New World Development Company Limited acted as the holding company of both Citybus and the New World First Bus from the beginning of their franchises in the year of 1991 and 1998 respectively. On the other hand, there are no records of any property developer holding shares in the former franchised bus company, the China Motor Bus Company, despite there was a joint venture formed between CMB and the Swire Properties Limited for a residential development in the Eastern District of Hong Kong in 2007.

The second dummy variable M is 1 only when its operation is in the same region. For example, the MTR began its first phase of operation in Kowloon in 1979, whereas its Island Line commenced in 1985. In other words, for observations for KMB, M equals 1 from 1979 onwards; for CMB, M equals 1 from 1985 onwards. M is 1 for all observations about CTB and NWFB. Given the dominant physical locations of bus operations of different companies, L equals 1 for CMB, CTB and NWFB; and 0 for KMB.

It should also be noticed that in the model, the equation capturing the service efficiency level is represented by a function to the

midpoint between the minimum fare and maximum fare charged. Furthermore, the fares charged are deflated using respective indicators. The rationale for choosing the service fees charged as cost indicator is twofold. For one thing, the service efficiency should be measured in terms of cost per kilometre, thus making the bus fare charged according to service mileage a proper dependent variable for the model. For another thing, the bus fare statistics shown in the Hong Kong Annual Reports and the book The Hong Kong Bus by Chen (1999) are the most accurate data available given the time limitation for writing this dissertation.

Data Descriptions

There is a total of 89 observations for the regression test. A total of 40 observations from KMB from year 1961 to 2007 with 7 years are omitted in the interviewing years. The omission is due to incomplete records or exceptional situations which may lead to misinterpretation of the data. For example, the observations for the years 1967 and 1968 are omitted because of political disturbances.

> "Throughout the troubles, there was never a complete suspension of public transport, although services had to be reduced by varying degrees because of the loss of staff by the companies.

> "On June 23, the CMB found itself with approximately 46 per cent staff and the KMB with 32 per cent [still reporting duties]. After the stoppages, a programme of re-employment of suspended or dismissed employees met with poor response and the companies had to recruit new and untrained labour. This ruled out any chance of an immediate return to normal operating conditions.
>
> "By the end of 1967, the CMB was operating 77 per cent of normal services and the KMB 75 per cent." (Hong Kong Annual Report, 1967: 190-191)
>
> "It is, perhaps, unrealistic to compare transport statistics for 1968 with those of the preceding year since the operations of all five major public transport companies were affected in varying degrees by stoppages during the 1967 disturbances." (Hong Kong Annual Report, 1968: 200-201)

Among the 89 observations, 28 are for the CMB for the year 1961 to 1998 (with data of 10 years omitted for similar reasons as above). A total of 12 observations are for the Citybus for the year 1993 to 2007 with 3 years omitted. A total of 9 observations are for New World First Bus for the year 1998 to 2007 with 1 year omitted.

In addition to the regression model capturing the ownership structure effect to service efficiency, there are also three separate models for four franchised bus companies aiming at canvassing the issue of economies of scale in the second hypothesis.

For KMB, the charge midpoint depends on passenger carried per year, ownership structure, MTR operation and finally Deflator capturing the change of price level. The passenger carried per year is assumed to be a proper measure for the operation scale. However, there is no dummy variable P in the models for CMB, CTB or NWFB as they did not encounter any change in ownership structure during the study period. Finally, there is no dummy variable M in the models for CTB or NWFB as the MTR keeps operating during the study period. The number of observations for each company is the same as it is in the first model for ownership structure.

For the third hypothesis, regarding the impact of MTR operation, the results can be inferred from three models above, namely, the model pooled with data coming from four companies and also two individual models for both KMB and CMB because they capture the MTR operation by the dummy variable M.

CHAPTER 4

EMPIRICAL FINDINGS

Following the discussion on hypotheses and methodologies in the last chapter, this chapter analyzes the empirical results for all three hypotheses. The first hypothesis (H1) is not supported by any empirical evidence in the context of Hong Kong; whereas the second hypothesis (H2) is partially supported and the third hypothesis (H3) is fully supported by the data.

Findings about Ownership Structures

First of all, the first hypothesis (H1) that the involvement of property developers in the bus transit companies has a positive impact on the service efficiency is not supported. As we can observe from Table 1, the coefficient of the dummy variable P is positive. The result is significant as both R-squared and Adjusted R-squared are greater than 0.75. Furthermore, the Probability of P is less that 0.1%. When P is positive, it means that the bus fare increases when a property developer partially or fully holds the bus transit company's shares. This result indeed refutes the argument for the first hypothesis.

In addition to the pooled data from four franchised bus transit companies, the coefficient of P is also positive in the individual model for KMB. As shown in Table 2, the result is significant, given the values of R-squared and Adjusted R-squared.

Nevertheless, bus fare is only an indicator of the cost per kilometre rather than the exact cost. In other words, the non supporting results could be the result of data limitations. Recall that the original cost function indentifies the cost as the dependent variable. However due to various limitations[5], the only available data are the bus fares charged by different bus companies. In addition, as there is no way to access such key information as the profits or the actual operational costs of different companies, bus fares become the best alternative cost indicator. As a result, when bus fare increases, the operational costs may not necessary increase at the same time. Hence, it can be imperfect in capturing the trend of changes in costs over time.

[5] Because of the limitation of information available to the general public, the profit margins of different bus companies are not known. Given the time limitation of writing this dissertation, the bus fares recorded in the Hong Kong Annual Report became one of the best alternatives of cost per kilometer.

On the other hand, as we can observe from Table 7, the dummy variable P in the individual model for KMB, with the price level deflated by CPI (instead of the GDP deflator), has a positive coefficient. This result does not refute the first hypothesis (H1) and is considered to be significant given the high values of both the R-squared and Adjusted R-squared. This result indicates that the bus fare charged after a property developer came into the picture has actually *decreased*. In other words, at least for KMB, the involvement of a property developer (in which case Sun Hung Kai Properties) as an owner of its shares has improved its service efficiency in terms of fares. Nevertheless, no concrete conclusion can be drawn, as the probability of the coefficient is approximately 0.75, suggesting inaccuracy of the results. At the same time, the pooled data model deflated by CPI, as shown in Table 6, also shows a positive coefficient of P at a significant level of 1% in terms of probability of error.

Dependent Variable: CHARGE1

Method: Least Squares

Date: 03/20/09 Time: 19:55

Sample: 1 89

Included observations: 89

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.425498	2.349802	-0.181078	0.8567
PASSENGER	-0.001229	0.002893	-0.424725	0.6721
P	4.558732	1.297820	3.512608	0.0007
M	-2.717586	1.763485	-1.541031	0.1271
L	0.369281	2.098635	0.175962	0.8608
DEFLATOR	0.141604	0.018791	7.535621	0.0000

R-squared	0.780585	Mean dependent var	9.472584
Adjusted R-squared	0.767367	S.D. dependent var	7.556801
S.E. of regression	3.644798	Akaike info criterion	5.489514
Sum squared resid	1102.618	Schwarz criterion	5.657288
Log likelihood	-238.2834	Hannan-Quinn criter.	5.557139
F-statistic	59.05572	Durbin-Watson stat	0.453816
Prob(F-statistic)	0.000000		

Table 1 Pooled Data Results (GDP Deflator)

There can be at least one definite conclusion drawn from these conflicting results: the impact on service efficiency due to a property developer becoming a holder of the bus company's shares demands more

detailed investigation. One of the most important issues is to find out the exact costs of different franchised bus companies over time.

For another thing, the cost function can be refined by taking the network impact into consideration, by looking into such variables as the number of routes of different bus companies and the average number of bus stops per route.

Dependent Variable: CHARGE2
Method: Least Squares
Date: 03/20/09 Time: 20:00
Sample: 1 89
Included observations: 89

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.815964	2.068466	-0.877928	0.3825
PASSENGER	-0.001102	0.002536	-0.434756	0.6649
P	3.090656	1.159916	2.664551	0.0093
M	-3.337529	1.521474	-2.193616	0.0311
L	-0.273113	1.843494	-0.148150	0.8826
CPI	0.205318	0.018975	10.82027	0.0000

R-squared	0.853996	Mean dependent var	10.10247
Adjusted R-squared	0.845200	S.D. dependent var	8.122616
S.E. of regression	3.195811	Akaike info criterion	5.226595
Sum squared resid	847.6965	Schwarz criterion	5.394368
Log likelihood	-226.5835	Hannan-Quinn criter.	5.294219
F-statistic	97.09523	Durbin-Watson stat	0.501978
Prob(F-statistic)	0.000000		

Table 2 Pooled Data Results (CPI)

Findings on Economies of Scale

The second hypothesis (H2) that the market of bus transit services in Hong Kong is subject to increasing return to scale can be partially proved by individual studies on the four franchised bus companies. Different companies have different performance in terms of economies of scale.

First of all, the Kowloon Motor Bus (1933) Company is enjoying *increasing return to scale* as shown by the result in Table 2. The coefficient of the passenger is approximately -0.0004, which means that it is on a decreasing cost curve. The result is considered to be significant if only taking the values of both R-squared and Adjusted R-squared into consideration; its probability is considerably large at a value of 0.94.

At the same time, empirical evidence indicates that both China Motor Bus Company and New World First Bus Company are also enjoying increasing return to scale as their coefficient of the passenger is -0.009 and -0.003 respectively. Both results are considered significant given the R-squared and Adjusted R-squared and a probability less than 1% as shown in Table 5.3 and Table 5.5. As showing in Table 4, the coefficient of passenger is positive 0.098. Notably, this result is

significant not only in terms of large values of both R-squared and Adjusted R-squared but also probability, which is far below 0.1%.

Dependent Variable: CHARGE1
Method: Least Squares
Date: 03/21/09 Time: 11:48
Sample: 1 40
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.501520	3.132551	-0.160100	0.8737
PASSENGER	-0.000402	0.005206	-0.077244	0.9389
P	8.91E-05	2.999425	2.97E-05	1.0000
M	-1.485032	3.313042	-0.448238	0.6567
DEFLATOR	0.164586	0.019153	8.593015	0.0000

R-squared	0.853565	Mean dependent var	8.226000
Adjusted R-squared	0.836830	S.D. dependent var	6.823498
S.E. of regression	2.756304	Akaike info criterion	4.982127
Sum squared resid	265.9023	Schwarz criterion	5.193237
Log likelihood	-94.64253	Hannan-Quinn criter.	5.058457
F-statistic	51.00367	Durbin-Watson stat	0.346608
Prob(F-statistic)	0.000000		

Table 3 Return to Scale of KMB (GDP Deflator)

Dependent Variable: CHARGE1

Method: Least Squares

Date: 03/21/09 Time: 11:28

Sample: 1 28

Included observations: 28

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.186721	0.792074	1.498245	0.1471
PASSENGER	-0.009412	0.003064	-3.071380	0.0052
M	-2.025304	0.907204	-2.232468	0.0352
DEFLATOR	0.138680	0.011472	12.08880	0.0000

R-squared	0.944844	Mean dependent var	5.117500
Adjusted R-squared	0.937950	S.D. dependent var	4.766947
S.E. of regression	1.187443	Akaike info criterion	3.313046
Sum squared resid	33.84052	Schwarz criterion	3.503361
Log likelihood	-42.38264	Hannan-Quinn criter.	3.371227
F-statistic	137.0432	Durbin-Watson stat	1.712988
Prob(F-statistic)	0.000000		

Table 4 Return to Scale of CMB (GDP Deflator)

Recall that in the literature review, there is a split in opinions regarding the economies of scale in local bus transit services over the world. According to the logic of Cowie and Asenova (1999), CTB could have exceeded the efficiency level, beyond which there is no longer increasing but decreasing returns to scale. However, CTB is in fact smaller in scale than KMB in terms of the size of fleet, number of

passengers carried per year, number of routes or mileage covered per year. Yet KMB has economies of scale but CTB has not. This is contradictory to the proposition of Cowie and Asenova (1999) that “increasing returns to scale are found for smaller companies”. One of the possible explanations in favour of Cowie and Asenova is that the variables are not held constant for KMB and CTB. For example, the difference in the main service locations may have complicated the analysis.

Besides, the difference in the ownership structures thus a management mode which may also contribute to this contradiction. The best evidence is that when comparing CTB and NWFB, the former is larger in scale in terms of the size of fleet, number of passengers carried per year, number of routes and mileage covered per year. It should be noticed that both CTB and NWFB are held under the NWS Group and both operate mainly on the Island. In other words, when these two companies operate under similar conditions, the smaller one (NWFB) reaps increasing returns to scale; whereas the bigger one (CTB) is not. In a nutshell, CTB may have already exceeded the efficiency level, beyond which a larger scale could not lead to a lower unit cost, given its current technology and service level. At the same time, other three franchised bus companies, including one former franchised company, are found to enjoy economies of scale.

The general implication of these results is that a monopoly power shall be allowed to a certain degree in the franchised bus service in Hong Kong. The reason is that a larger scale could lead to lower costs.

Dependent Variable: CHARGE1
Method: Least Squares
Date: 03/21/09 Time: 11:35
Sample: 1 12
Included observations: 12

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.24352	6.444499	2.520525	0.0327
PASSENGER	0.097712	0.007788	12.54601	0.0000
DEFLATOR	-0.130130	0.056329	-2.310185	0.0462

R-squared	0.950294	Mean dependent var	17.99750
Adjusted R-squared	0.939248	S.D. dependent var	7.237500
S.E. of regression	1.783890	Akaike info criterion	4.207788
Sum squared resid	28.64039	Schwarz criterion	4.329015
Log likelihood	-22.24673	Hannan-Quinn criter.	4.162906
F-statistic	86.03228	Durbin-Watson stat	1.645664
Prob(F-statistic)	0.000001		

Table 5 Return to Scale of CTB (DGP Deflator)

Dependent Variable: CHARGE1

Method: Least Squares

Date: 03/21/09 Time: 11:41

Sample: 1 9

Included observations: 9

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	35.70174	0.459052	77.77275	0.0000
PASSENGER	-0.003064	0.000695	-4.407838	0.0045
DEFLATOR	-0.165598	0.003419	-48.43416	0.0000

R-squared	0.998386	Mean dependent var	17.19556
Adjusted R-squared	0.997848	S.D. dependent var	1.481639
S.E. of regression	0.068732	Akaike info criterion	-2.256007
Sum squared resid	0.028344	Schwarz criterion	-2.190265
Log likelihood	13.15203	Hannan-Quinn criter.	-2.397877
F-statistic	1855.782	Durbin-Watson stat	2.886060
Prob(F-statistic)	0.000000		

Table 6 Return to Scale of NWFB (GDP Deflator)

It should be noticed that the test using CPI deflated data yield the same results. From Tables 7 to 10, we can observe that the coefficient of passenger of KMB is negative at 0.002; the measure for CMB negative 0.012; CTB positive 0.103; and finally NWFB negative 0.0025.

Dependent Variable: CHARGE2
Method: Least Squares
Date: 03/21/09 Time: 11:47
Sample: 1 40
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.040712	2.503221	-0.415749	0.6801
PASSENGER	-0.001939	0.004184	-0.463470	0.6459
P	-0.742362	2.407999	-0.308290	0.7597
M	-0.915495	2.657287	-0.344523	0.7325
CPI	0.218855	0.017472	12.52584	0.0000

R-squared	0.921002	Mean dependent var	8.765500
Adjusted R-squared	0.911973	S.D. dependent var	7.445549
S.E. of regression	2.209041	Akaike info criterion	4.539463
Sum squared resid	170.7952	Schwarz criterion	4.750573
Log likelihood	-85.78925	Hannan-Quinn criter.	4.615793
F-statistic	102.0119	Durbin-Watson stat	0.697992
Prob(F-statistic)	0.000000		

Table 7 Return to Scale of KMB (CPI)

Dependent Variable: CHARGE2

Method: Least Squares

Date: 03/21/09 Time: 11:29

Sample: 1 28

Included observations: 28

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.489323	1.025056	0.477362	0.6374
PASSENGER	-0.012053	0.003893	-3.096113	0.0049
M	-1.707073	1.136430	-1.502137	0.1461
CPI	0.181821	0.016951	10.72631	0.0000

R-squared	0.934519	Mean dependent var	5.516429
Adjusted R-squared	0.926334	S.D. dependent var	5.559239
S.E. of regression	1.508861	Akaike info criterion	3.792151
Sum squared resid	54.63987	Schwarz criterion	3.982466
Log likelihood	-49.09011	Hannan-Quinn criter.	3.850332
F-statistic	114.1729	Durbin-Watson stat	1.363867
Prob(F-statistic)	0.000000		

Table 8 Return to Scale of CMB (CPI)

Dependent Variable: CHARGE2

Method: Least Squares

Date: 03/21/09 Time: 11:36

Sample: 1 12

Included observations: 12

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.14512	6.996930	1.449939	0.1810
PASSENGER	0.103097	0.007815	13.19297	0.0000
CPI	-0.077485	0.072801	-1.064337	0.3149

R-squared	0.954695	Mean dependent var	19.17083
Adjusted R-squared	0.944627	S.D. dependent var	7.147261
S.E. of regression	1.681848	Akaike info criterion	4.089981
Sum squared resid	25.45751	Schwarz criterion	4.211208
Log likelihood	-21.53989	Hannan-Quinn criter.	4.045099
F-statistic	94.82726	Durbin-Watson stat	1.804676
Prob(F-statistic)	0.000001		

Table 9 Return to Scale of CTB (CPI)

Dependent Variable: CHARGE2

Method: Least Squares

Date: 03/21/09 Time: 11:41

Sample: 1 9

Included observations: 9

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	38.80253	1.225638	31.65905	0.0000
PASSENGER	-0.002509	0.001166	-2.150913	0.0750
CPI	-0.197479	0.010373	-19.03815	0.0000

R-squared	0.993199	Mean dependent var	18.22111
Adjusted R-squared	0.990932	S.D. dependent var	0.947133
S.E. of regression	0.090192	Akaike info criterion	-1.712561
Sum squared resid	0.048807	Schwarz criterion	-1.646819
Log likelihood	10.70652	Hannan-Quinn criter.	-1.854431
F-statistic	438.1137	Durbin-Watson stat	2.482278
Prob(F-statistic)	0.000000		

Table 10 Return to Scale of NWFB (CPI)

Findings on Impact of MTR

Finally, the third hypothesis that the operation of MTR has a positive impact on franchised bus service efficiency is fully supported by empirical evidence. To begin with, Table 1 showing the pooled data from four companies reveals that the coefficient of the dummy variable M is negative 2.72 and significant.

In addition, the individual tests for KMB and CMB also yield the same result with the coefficient being negative 1.49 and 2.03 respectively. Both of the results are considered significant as shown in Table 2 and Table 3 respectively. It is worth mentioning that even test using data deflated by CPI instead of the GDP deflator yield similar results. They are shown in Table 6, Table 7 and Table 8 respectively.

An intuition about the results is quite obvious. The Mass Transit Railway is a major competitor with the franchised bus service. This result also leads support to the argument presented previously in the historical review. There are thus reasons to believe that although three companies out of four are subject to economies of scale, the introduction of an external competitor can do more good than harm. In other words, a competitive business environment is of great value to enhance market efficiency.

CHAPTER 5

CONCLUSION

This chapter includes two components. Firstly, it summarizes the ideas and empirical findings of previous chapters. The interpretation of these empirical findings then leads to the identification of the limitations of this dissertation and possible directions for future research.

Summary of Key Points

This dissertation applies the ideas in "The Federal Communications Commission" (Coase, 1959) to study the government franchise to bus transit services in Hong Kong. The history of the bus franchise in Hong Kong is also reviewed so as to provide a clearer context for the research. In order to examine the market efficiency of the franchised bus transit services, three empirical hypotheses in light of the historical development are designed. They are regarding the involvement of property developers, the question of economies of scale, and finally the impacts of the MTR. The methodology used to test these three empirical hypotheses is learned from literature on the ownership structure of bus services and their impact on services efficiency.

"Coase was actually more Pigovian than Coasian" (Lai, 2007: 363). The ideas in "The Federal Communications Commission" (Coase, 1959) indeed justified the initiative of government franchise, provided that there are free reallocations of rights to the public bus transit services later on.

Who owns the public roads in the first place do not affect market efficiency provided that there can be a free pricing mechanism to reallocate these rights. In other words, the minimum government intervention is preferable after private companies initially obtained the rights to use the public roads in terms of providing bus transit services to the public.

Discussion

The empirical findings have two lessons: (a) market efficiency can be improved by monopoly power; and (b) market efficiency can be increased with growing competition, in this dissertation the competition from the MTR. Monopoly power contributes to market efficiency when the company is subject to economies of scale. At the same time, introducing competition in the form of a substitute can improve the service efficiency. The policy implication for government is that in order

to ensure transportation efficiency, it is not necessary to create another franchise. Introducing a good railway system can achieve the same result.

The impact of the involvement of a property developer on a bus company is ambiguous. According to theoretical arguments, a higher level of private sector involvement in a bus company should improve the service efficiency. However, the Hong Kong empirical data are showing quite the opposite results.

Limitations and Further Study

The major limitation of this dissertation, given the author's time constraints, is one of data limitation. For one thing, bus fare is used as an indicator of the unit cost of different companies, i.e., the cost per kilometer. However, this indicator is not as accurate as the exact profit margins, which are unfortunately unknown. This inaccuracy may have directly caused the disappointing results of the tests. Besides, the cost function adopted in the model cannot take into account the effects of network of different bus companies, for example, different number of routes, different number of stops per route, and service location which often affect evaluation of economies of scale.

Therefore, any future study should be based on data that capture the unit costs more accurately. At the same time, the cost function can also be refined to take network effects into consideration. These include the numbers of routes; different number of stops per route and service location of different bus companies.

APPENDICES

1. KMB Operation Data

Year	Total No. of Routes	Total No. of Registered Buses	Passenger Carried (Persons in million)	Journey Covered by the Whole Fleet (in million kilometers)	Fares[6] (Hong Kong Dollar at 2006 price level)
1961	55	721	437	35	1.60
1962	59	777	483	38.8	1.56
1963	62	866	514	39.6	1.50
1964	64	946	547	40.3	1.43
1965	64	1004	593	45.7	1.40
1966	65	1055	643	47.2	1.39
1970	70	1018	568	40.4	1.09
1972	84	1272	502	44.4	0.93
1973	92	1324	490	46.1	0.82
1974	106	1371	565	54.9	0.73
1975	137	1560	621	63	3.95
1976	150	1700	754	70	3.62
1977	159	1708	810	73.3	3.48
1978	178	1804	860	73.1	3.22
1979	194	1867	934	113	2.74
1980	192	2089	912	122	7.40
1981	192	2390	933	134	5.70
1982	192	2369	940	140	3.46
1983	177	2380	982	160	4.53
1984	178	2441	1069	170	4.12
1985	187	2511	1079	188	4.48
1986	213	2740	1108	210	4.32
1987	220	2900	1088	220	4.40
1990	261	2887	966	195.3	8.45
1991	251	3037	968	217	9.62
1992	268	3121	970	234	8.28
1993	301	3197	966	243	13.02
1994	306	3369	977	255	14.30
1995	302	3507	993	271	13.99
1997	307	3839	1051	285	13.12
1998	334	3991	1030	329	15.42
1999	334	4064	1100	344	16.13
2000	332	4238	1080	329	16.75

[6] It is the mid point of the maximum fare and minimum fare and deflated by GDP deflator. (2006=100)

(Con't) Year	Total No. of Routes	Total No. of Registered Buses	Passenger Carried (Persons in million)	Journey Covered by the Whole Fleet (in million kilometers)	Fares[7] (Hong Kong Dollar at 2006 price level)
2001	337	4371	1110	349	17.07
2002	337	4430	1130	349.9	17.67
2003	404	4284	1060	344.3	18.85
2004	398	4141	1060	342.8	19.72
2005	395	4021	1010	339	19.74
2006	395	4013	1010	336	19.80
2007	393	4027	1010	331	19.24

[7] It is the mid point of the maximum fare and minimum fare and deflated by GDP deflator. (2006=100)

2. CMB Operation Data

Year	Total No. of Routes	Total No. of Registered Buses	Passenger Carried (Persons in million)	Journey Covered by the Whole Fleet (in million kilometers)	Fares[8] (Hong Kong Dollar at 2006 price level)
1961	21	307	120	12	1.60
1962	21	325	134	13.5	1.56
1963	28	360	143	14.2	1.50
1964	31	394	159	15.3	1.43
1965	31	459	169	16.6	1.40
1966	31	498	187	18.7	1.39
1970	29	499	186	17.2	1.09
1971	29	483	175	15.3	1.02
1973	39	565	181	15.5	0.82
1974	47	595	216	19.7	0.73
1975	57	629	230	22.8	3.02
1976	66	702	240	26.4	2.77
1980	99	985	287	42	2.79
1981	86	1028	312	43	3.29
1982	92	1047	348	45	5.31
1983	80	1090	363	52	5.08
1984	84	1076	344	55	3.32
1985	80	1054	318	55	3.15
1986	96	1019	318	55	4.14
1987	96	925	318	56	3.81
1990	87	1026	267	51.7	5.25
1991	94	1020	262	52	9.74
1992	97	1027	236	52	8.87
1993	91	1014	197	48	13.41
1994	93	961	191	44	14.71
1995	86	883	179	44.3	14.13
1997	85	746	176	44.5	13.56
1998	44	718	105	30.3	14.40

[8] It is the mid point of the maximum fare and minimum fare and deflated by GDP deflator. (2006=100)

3. CTB Operation Data

Year	Total No. of Routes	Total No. of Registered Buses	Passenger Carried (Persons in million)	Journey Covered by the Whole Fleet (in million kilometers)	Fares[9] (Hong Kong Dollar at 2006 price level)
1993	24	200	22	3.6	6.78
1994	35	144	68	12	6.92
1995	47	338	88	17.1	7.75
1997	48	375	120	25	13.56
1998	86	955	183	65	18.88
2001	89	957	216	82	20.69
2002	90	956	220.4	83.7	21.42
2003	90	940	207.3	82.8	22.84
2004	89	911	210.8	84.2	23.66
2005	89	910	205.8	82.3	23.68
2006	88	909	207.8	82.4	25.25
2007	90	919	210.4	82.5	24.54

[9] It is the mid point of the maximum fare and minimum fare and deflated by GDP deflator. (2006=100)

4. NWFB Operation Data

Year	Total No. of Routes	Total No. of Registered Buses	Passenger Carried (Persons in million)	Journey Covered by the Whole Fleet (in million kilometers)	Fares[10] (Hong Kong Dollar at 2006 price level)
1998	63	841	47	13.8	14.52
2000	65	730	187	55.5	15.64
2001	61	757	194.5	56.7	16.20
2002	62	769	195.5	60.9	16.77
2003	73	730	180.5	59.4	17.88
2004	69	695	184.6	56.4	18.53
2005	66	694	177.5	52.1	18.54
2006	65	694	183.1	50.9	18.60
2007	65	694	184.4	50.4	18.08

[10] It is the mid point of the maximum fare and minimum fare and deflated by GDP deflator. (2006=100)

5. GDP Deflator and CPI Source[11]

%

Year	Gross domestic product	Per capita GDP	Domestic demand	Final demand	(1) Private consumption expenditure	(2) Government consumption expenditure
1961	-	-	-	-	-	-
1962	14.2	9.4	17.7	13.7	10.7	4.9
1963	15.7	11.8	19.2	13.9	9.6	10.8
1964	8.6	6.0	9.8	9.6	8.8	9.8
1965	14.5	11.5	12.1	10.9	12.9	8.3
1966	1.7	0.9	1.1	5.0	12.1	11.2
1967	1.7	-0.9	-4.5	1.7	1.3	10.6
1968	3.4	1.2	3.6	7.3	10.1	5.8
1969	11.3	9.5	7.4	11.0	8.6	8.6
1970	9.2	6.6	11.1	10.9	10.6	5.8
1971	7.2	4.9	15.3	9.8	12.9	2.4
1972	10.5	8.4	7.6	8.2	7.5	6.1
1973	12.3	9.2	12.6	11.0	13.3	10.1
1974	2.3	-0.9	-0.4	-1.7	-2.2	9.2
1975	0.4	-1.5	2.8	2.1	3.6	6.3
1976	16.2	14.8	13.7	18.7	7.6	6.8
1977	11.8	10.2	15.9	10.6	16.9	9.3
1978	8.4	6.4	14.5	13.5	17.3	9.9
1979	11.6	5.7	11.7	13.7	9.5	10.6
1980	10.3	7.4	14.0	13.5	12.2	7.4
1981	9.4	6.8	8.9	10.9	7.6	21.9
1982	3.0	1.4	2.3	1.0	5.3	5.5
1983	5.9	4.3	3.8	7.4	7.7	6.0
1984	9.9	8.8	5.0	11.2	5.7	3.9
1985	0.7	-0.4	1.1	3.4	4.3	2.7
1986	11.0	9.7	9.5	12.1	8.5	6.5
1987	13.4	12.3	11.6	20.5	10.6	3.9
1988	8.4	7.5	9.3	17.2	9.3	3.8
1989	2.2	1.2	1.2	5.7	3.7	5.2
1990	3.9	3.6	7.3	8.0	6.3	5.5
1991	5.7	4.8	8.8	12.5	9.3	7.7
1992	6.1	5.2	9.2	14.3	9.1	7.1
1993	6.0	4.2	5.1	9.5	7.8	2.1
1994	6.0	3.7	10.7	10.0	6.4	3.8
1995	2.3	0.3	5.4	8.1	1.7	3.0
1996	4.2	-0.3	2.5	4.3	3.7	3.7
1997	5.1	4.2	7.9	6.2	5.5	2.2
1998	-6.0	-6.8	-7.7	-5.9	-5.5	0.5
1999	2.6	1.6	-3.6	0.9	1.2	3.1
2000	8.0	7.0	7.7	12.6	5.1	2.0
2001	0.5	-0.2	0.9	-0.7	1.8	6.0
2002	1.8	1.4	-0.7	5.0	-0.9	2.4
2003	3.0	3.2	-0.2	7.9	-1.3	1.8
2004	8.5	7.6	5.0	11.8	7.0	0.7
2005	7.1	6.6	1.6	7.7	3.0	-3.2
2006	7.0	6.3	6.0	8.4	5.9	0.3
2007@	6.4	5.3	7.9	8.2	8.5	3.0
2008@	2.5	1.7	1.1	2.2	1.8	2.0

[11] Source: Census and Statistics Department, the Government of the Hong Kong SAR

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